

Claims

1. A method of preparing ZSM-5, comprising the following steps of:
mixing a silica source, an alkali metal oxide source, an alumina source and water, to prepare a reaction mixture having a molar composition of M_2O/SiO_2 (M: alkali metal ion) of 0.07-0.14, H_2O/SiO_2 of 15-42 and SiO_2/Al_2O_3 of 20-100;
maintaining the reaction mixture at 180-210 °C for a reaction time controlled in a range of 2-20 hours according to an intended crystal size and a particle size distribution of the ZSM-5, to obtain a nucleated reaction mixture; and
maintaining the nucleated reaction mixture at 130-170 °C for 10-200 hours to form crystals of the ZSM-5.
2. The method as defined in claim 1, wherein the alkali metal oxide source is alkali metal hydroxide.
3. The method as defined in claim 1, wherein the alkali metal is sodium.
4. The method as defined in claim 1, wherein a molar ratio of the M_2O/SiO_2 is in the range of 0.09-0.14 when the molar ratio of the SiO_2/Al_2O_3 is 29 or higher.
5. The method as defined in claim 1, wherein the molar ratio of the M_2O/SiO_2 is in the range of 0.07-0.1 when the molar ratio of the SiO_2/Al_2O_3 is less than 29.
6. The method as defined in claim 1, wherein the alumina source is sodium aluminate or aluminum hydroxide.
7. The method as defined in claim 1, wherein the silica source is selected from the group consisting of colloidal silica, sodium silicate, white carbon and boehmite.

8. The method as defined in claim 1, wherein the ZSM-5 has an average crystal size of 1-6 μm .

9. The method as defined in claim 8, wherein the ZSM-5 has an average crystal size of 2-3 μm .

5 10. The method as defined in claim 4, wherein the ZSM-5 has a hexagonal crystal morphology.

11. The method as defined in claim 5, wherein the ZSM-5 has a spiral crystal morphology.

12. The method as defined in claim 5, wherein the nucleating step is performed
10 for 10-20 hours when the molar ratio of the $\text{SiO}_2/\text{Al}_2\text{O}_3$ is not more than 22.

13. The method as defined in claim 12, wherein the crystallizing step is performed for 96-200 hours.

14. The method as defined in claim 1, wherein the crystallizing step is performed until crystallinity reaches substantially 100%.

15 15. A method of preparing ZSM-5, comprising the following steps of:
 admixing a silica source, an alkali metal oxide source and water, to prepare a first aqueous solution;
 separately admixing an alumina source, an alkali metal oxide source and water, to prepare a second aqueous solution;
20 mixing the first aqueous solution with the second aqueous solution while being optionally added with water, to prepare a reaction mixture having a molar composition of $\text{M}_2\text{O}/\text{SiO}_2$ of 0.07-0.14, $\text{H}_2\text{O}/\text{SiO}_2$ of 15-42 and $\text{SiO}_2/\text{Al}_2\text{O}_3$ of 20-100;

maintaining the reaction mixture at 180-210 °C for a reaction time controlled in the range of 2-20 hours according to an intended crystal size and a particle size distribution of the ZSM-5, to obtain a nucleated reaction mixture; and

5 maintaining the nucleated reaction mixture at 130-170 °C for 10-200 hours to form crystals of the ZSM-5.

16. The method as defined in claim 15, wherein the silica source in the first aqueous solution amounts to 21.5-26.7 wt%, and the alumina source in the second aqueous solution amounts to 0.9-4.4 wt%.

10 17. The method as defined in claim 15, wherein the alkali metal oxide source is alkali metal hydroxide.

18. A method of preparing ZSM-5, comprising the following steps of:

admixing a silica source, an alkali metal oxide source and water, to prepare a first aqueous solution;

15 separately admixing an alumina source and water, to prepare a second aqueous solution;

mixing the first aqueous solution with the second aqueous solution while being optionally added with water, to prepare a reaction mixture having a molar composition of M_2O/SiO_2 of 0.07-0.14, H_2O/SiO_2 of 15-42 and SiO_2/Al_2O_3 of 20-100;

20 maintaining the reaction mixture at 180-210 °C for a reaction time controlled in the range of 2-20 hours according to an intended crystal size and a particle size distribution of the ZSM-5, to obtain a nucleated reaction mixture; and

maintaining the nucleated reaction mixture at 130-170 °C for 10-200 hours to form crystals of the ZSM-5.

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19. The method as defined in claim 18, wherein the silica source in the first

aqueous solution amounts to 21.5-26.7 wt%, and the alumina source in the second aqueous solution amounts to 0.9-4.4 wt%.

20. The method as defined in claim 18, wherein the alkali metal oxide source is alkali metal hydroxide.